

Claims

1. A power assist clutch system for effecting, in an automotive having a clutch; a drive force transmission member for transmitting a drive force to the clutch; and a clutch operation part coupled to the clutch via the drive force transmission member, an assist force for assisting an intermittent operation of the clutch caused by an operation force transmitted from the clutch operation part, the power assist clutch system comprising:

a detecting portion for detecting an operation force that operates the clutch operation part;

a control portion for outputting a control signal for controlling the assist force based on the operation force detected by the detecting portion;

an assist force generating portion for generating the assist force in accordance with the control signal output from the control portion; and

a drive force generating portion for generating a drive force for operating the clutch by combining the operation force transmitted through the drive force transmission member and the assist force.

2. The power assist clutch system as claimed in claim 1, wherein the detecting portion includes a sensor portion

including first and second sensors for detecting the operation force of the clutch operation part, first and second signal detecting parts, connected to the first and second sensors, for detecting signals output from the sensors, and an amplifying part for amplifying a difference between signals detected in the first and second signal detecting parts.

3. The power assist clutch system as claimed in claim 2, wherein the sensor portion includes a rod-shaped load receiving part made of a magnetic material for receiving a load from outside, and a coil wound around the load receiving part, and the sensor portion is a magnetostrictive load sensor for detecting a load based on a change of magnetic permeability caused by a strain of the load receiving part, which is due to a load based on an operation force of the clutch operation part applied to the load receiving part magnetized by current flowing through the coil.

4. The power assist clutch system as claimed in claim 3, wherein the load receiving part has a through-hole extending through a region including a longitudinal rod-like center shaft made of magnetic material.

5. The power assist clutch system as claimed in claim 2, wherein the sensor portion includes as the first and second

sensors a load sensor for detecting a load applied to the clutch operation part and a position sensor for detecting a position change of the clutch operation part.

6. The power assist clutch system as claimed in claim 2, wherein the sensor portion is provided in the clutch operation part.

7. The power assist clutch system as claimed in claim 2, wherein the sensor portion is provided near the clutch operation part.

8. The power assist clutch system as claimed in claim 2, wherein the sensor portion is attached to a mid part of the drive force transmission member.

9. The power assist clutch system as claimed in claim 1, further comprising an assist force changing portion for changing a ratio of the assist force to the operation force during a process of transmitting an operation force from the clutch operation part.

10. The power assist clutch system as claimed in claim 1, wherein the drive force transmission member is a wire or an oil piping.

11. A method for controlling a power assist clutch system for effecting, in an automotive having a clutch; a drive force transmission member for transmitting a drive force to the clutch; and a clutch operation part coupled to the clutch via the drive force transmission member, an assist force for assisting an intermittent operation of the clutch caused by an operation force transmitted from the clutch operation part, the method comprising:

a detecting step for detecting an operation force when a driver operates the clutch operation part;

a control step for outputting a control signal for controlling the assist force based on an operation force detected by the detecting means;

an assist force generating step for generating the assist force in accordance with the control signal output from the control step; and

a drive force generating step for generating a drive force for operating the clutch by combining the operation force transmitted through the drive force transmission member and the assist force.

12. The method for controlling a power assist clutch system as claimed in claim 11, wherein when an operation force detected by the detecting step exceeds a predetermined threshold value,

the control step outputs a control signal for controlling the assist force acting on the drive force transmission member.

13. The method for controlling a power assist clutch system as claimed in claim 11, wherein when a stopping state of the clutch operation part continues for a predetermined time or longer, the control step outputs a control signal for gradually decreasing the assist force.

14. The method for controlling a power assist clutch system as claimed in claim 11, wherein the control step controls increasingly or decreasingly a ratio of the assist force to the operation force during a process of transmitting an operation force from the clutch operation part.

15. The method for controlling a power assist clutch system as claimed in claim 11, wherein the control step compares an operation speed of the clutch operation part with a driving speed of an assist force generating part for generating an assist force, and outputs a control signal to make the operation speed and the driving speed equal to each other.

16. A program for controlling a power assist clutch system for effecting, in an automotive having a clutch; a drive force transmission member for transmitting a drive force to the clutch;

and a clutch operation part coupled to the clutch via the drive force transmission member, an assist force for assisting an intermittent operation of the clutch caused by an operation force transmitted from the clutch operation part, the program causes a computer to function as control means for outputting a control signal for controlling the assist force in accordance with an operation force detected by a detecting part for detecting the operation force.

17. The program for controlling a power assist clutch system as claimed in claim 16, wherein when an operation force exceeds a predetermined threshold value, the control means outputs a control signal for controlling the assist force acting on the drive force transmission member.

18. A program for controlling a power assist clutch system as claimed in claim 16, wherein when a stopping state of the clutch operation part continues for a predetermined time or longer, the control means outputs a control signal for gradually decreasing the assist force.

19. The program for controlling a power assist clutch system as claimed in claim 16, wherein the control means controls increasingly or decreasingly a ratio of the assist force to the operation force during a process of transmitting an operation

force from the clutch operation part.

20. The program for controlling a power assist clutch system as claimed in claim 16, wherein the control means compares an operation speed of the clutch operation part with a driving speed of an assist force generating part for generating an assist force, and outputs a control signal to make the operation speed and the driving speed equal to each other.